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ABSTRACT

The supply and demand were projected for university teaching positions in departments listed in the "Industrial Teacher Education Directory" based upon age distribution, retirement projections, and number of doctoral graduates. Data were collected through a mail survey to department heads/chairs. The specific age distribution of industrial education faculty indicated the profession is growing older with one-fifth of the faculty 55 years old or older. Early retirement options had already had an impact on faculty over 55. Not quite two-thirds of the respondents indicated that their institutions had an early retirement option. Department heads estimated 268 new positions and a loss of 92 positions. Findings suggested it had been relatively difficult for department heads to hire replacement faculty. Of those indicating an area, 44.8 percent indicated that electronics-related specialties were the most difficult to fill. There were 357 doctoral students pursuing a program in an area related to industrial education. Data indicated that there will be supply/demand problems in attempting to fill university faculty positions in industrial education with individuals who hold the doctorate. Approximately 1.2 vacancies per doctoral student in the next five years were projected. (YLB)

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SUPPLY/DEMAND FOR INDUSTRIAL EDUCATION UNIVERSITY FACULTY

BASED ON RETIREMENT PROJECTIONS:

Implications for Industrial Teacher Education, Research and Leadership Development

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Implications for Industrial Teacher Education, Research and Leadership Development

Prepared by

Thomas L. Erekson and Lyndall L. Lundy

Introduction

Recent attention to teacher supply and demand suggests that the nation will face a general shortage of qualified individuals who will accept teaching positions (Applegate & McLeary, 1982; Bowen, 1985; Darling-Hammond, 1984; DeRoche & Kujawa, 1982; Horn 1985). The projected shortages will be critical in populated sun-belt states and in rural areas (Bowen, 1985; Horn, 1985). The National Center for Educational Statistics estimated the demand for new teachers in 1991 to be 200,000 and projected 134,000 prospective teacher education graduates which will produce a shortfall of 66,000 in supply of new teachers (Bowen, 1985). The increased demand for teachers comes as a result of low salaries, low prestige occupation, an aging teacher force, and a new baby boomlet (Bowen, 1985).

While a general teacher shortage has been predicted, there are specific teaching areas where the shortage will be acute. Historically there has been a shortage of industrial education teachers and the shortage of teachers in these areas has been projected to continue (Applegate & McLeary, 1982).

Universities have traditionally had the responsibility to prepare teachers. To effectively deal with the shortage of industrial education teachers, universities will need to recruit students and prepare more teachers than are being graduated today. However, employing qualified university faculty with the educational credentials and technical expertise to prepare industrial education teachers is not an easy task. Universities often compete with higher paying private sector jobs for the same personnel. Thus, the pool of potential faculty often is diminished.

Studies have been conducted to project supply and demand for university level faculty. Shulman (1979) projected a 16% surplus of PhD's by 1982 and a 36% surplus by 1986. Fernandez (1978) conducted a study for the Carnegie Council on Policy Studies in Higher Education and projected an over supply of doctoral graduates to fill university faculty positions through the year 2000. The Fernandez projections were based upon demographic data, retirement trends, tenure denials and life expectancy.

While an over supply of doctoral graduates may be the case for several subject areas in higher education, an over supply of doctoral graduates who have been willing to accept university employment in industrial education has not materialized. Department heads who have attempted to fill vacant faculty positions are all too aware of the shortage of doctoral level faculty with expertise in industrial education. Who then will prepare the industrial education teachers needed to address the projected shortage? What are the supply/demand data for university positions in industrial education? Is the profession approaching a time of oversupply or shortage of qualified faculty who are willing to accept positions at universities?

Statement of the Problem

The problem of this study was to project the supply and demand for university teaching positions in departments listed in the Industrial Teacher Education Directory (Dennis, 1984-85) based upon age distribution, retirement projections and number of doctoral graduates.

Methods

The data were collected through a mail survey to department heads/chairs listed in the 1984-85 Industrial Teacher Education Directory. The survey instrument requested data about early retirement options, age distribution of faculty in five year increments, anticipated new positions (additional) and anticipated positions that will be lost, the most difficult positions to fill by technical teaching area and the number of active doctoral students in industrial education. Data about doctoral graduates provided in the ITE Directory were also reviewed and analyzed.

Findings

Of the 252 department heads/chairs listed in the ITE Directory, 225 responded to the survey (89%). The following tables present the findings of the study.

Age Distribution of University Faculty

University faculty in industrial education were found to be older than the total male population of post secondary faculty. The median age for all male faculty was 40.1 years old (1980 census data) and the median age for industrial education university faculty was 46.5 years old. The comparison to all male faculty was made because approximately 99% of the faculty listed in the ITE Directory were males.

The specific age distribution of industrial education faculty in 1985 indicated that the profession is growing older with one-fifth (20.4%) of the faculty 55 years old or older (see Table 1.1). Almost two-fifths (39.0%) of the faculty were 50 years old or over. A closer look at the distribution suggests that early retirement options may already have had an impact on faculty over 55. There were approximately the same percentage of faculty in the 50-54 age bracket as in the three brackets over 55 (55-59, 60-64, over 65).

Table 1.1

AGE DISTRIBUTION OF UNIVERSITY FACULTY

Age	N	%	Cum %
Over 65	33	1.4	1.4
60-64	180	7.8	9.2
55-59	258	11.2	20.4
50-54	426	18.6	39.0
45-49	420	18.3	57.3
40-44	372	16.2	73.5
35-39	321	14.0	87.5
30-34	188	8.2	95.7
Under 30	98	4.3	100.0
Total	2296	100.0	

Early Retirement Options

Not quite two-thirds (64.5%) of the respondents indicated that their institutions had an early retirement option (see Table 1.2). The department heads/chairs reported several different options available for early retirement. These options were placed into categories based upon the youngest age for early retirement (see Table 1.3). Of the 135 respondents who indicated an early retirement option, over 50% reported the earliest age for retirement was 55 years old or younger.

Table 1.2

INSTITUTIONS WITH AN EARLY RETIREMENT OPTION

	N	%
Yes	142	64.5
No	78	35.5

Table 1.3

EARLIEST AGE FOR RETIREMENT

Age	N	%
55 or younger	70	51.9
56-60	23	17.0
61-65	32	23.7
Based on years of service	10	7.4
Total	135	100.0

Table 1.4 provides a crosstabulation of the age distribution with the youngest age of early retirement options for the faculty 45 years old or older. Table 1.4 provides the basis to make best case/worst case retirement projections. The worst case (every faculty member takes early retirement at the earliest age possible) would produce 467 retirements in the next five years (adding all faculty above the line). The best case (everyone retiring at age 65) would produce 213 retirements in the next five years.

Table 1.4

EARLIEST AGE FOR RETIREMENT BY AGE DISTRIBUTION

Retirement Age	Over 65	60-64	55-59	50-54	45-49
55 or younger	16	62	111	179	164
56-60	2	16	34	43	49
61-65	2	32	31	57	59
Years of service	1	13	5	18	15
Total	21	123	181	297	287
Total in age bracket	33	180	258	426	420

Additional New Positions Anticipated

The department heads were asked to estimate the number of new (additional) positions they anticipated being authorized in the next five years. Table 1.5 presents the distribution with a total of 268 new positions being estimated by department heads.

Table 1.5

NEW POSITIONS ANTICIPATED (ADDITIONAL)

Number of Positions	N	%
0	99	44.0
1	49	21.8
2	44	19.6
3	17	7.6
4	7	3.1
5	6	2.7
6	2	.9
10	1	.4

Anticipated Lost Positions

The department heads were asked to estimate the number of positions they anticipated being lost (not replaced when a faculty member leaves) in the next five years. Table 1.6 presents the distribution with a total of 92 positions estimated being lost by department heads.

Table 1.6

POSITIONS ANTICIPATED TO NOT BE REFILLED

Number of Positions	N	%
0	181	80.4
1	22	9.8
2	9	4.0
3	6	2.7
4	4	1.8
5	1	.4
6	1	.4
7	1	.4

Difficulty in Hiring Replacement Faculty

The department heads were asked to estimate the difficulty they have had in hiring replacement faculty on a scale of 1 to 10 with 1 being very difficult and 10 being very easy. The mean score was 3.77 and the median was 3.07. This suggests that it has been relatively difficult to hire faculty.

The department heads were also asked to indicate the area of expertise that has been the most difficult to fill. Table 1.7 lists the difficult positions to fill in rank order by frequency of response. Of the 143 department heads who indicated an area, 44.8% indicated that electronics related specialties were the most difficult to fill.

Table 1.7

DIFFICULT POSITIONS TO FILL

Position	N	%*
Electronics	64	44.8
CAD-CAM	10	7.0
T & I	8	5.6
Engineering Technology	6	4.2
Graphic Arts	6	4.2
Construction	6	4.2
Metals/Manufacturing	5	3.5
Aeronautics	4	2.8
Energy/Power	4	2.8
Industrial Education	4	2.8
Robotics	3	2.1
Industrial Technology	3	2.1
Auto	3	2.1

* % of 143 responses

Doctoral Graduate Supply

The heads/chairs reported there were 357 doctoral students pursuing a program in an area related to industrial education (see Table 1.8). The ITE Directory reported 186 doctoral graduates in 1983-84. The question of whether these students/graduates were preparing to fill university teaching positions in industrial education is difficult to answer. Some of the students/graduates were from foreign countries and planned to return and others were currently employed at universities. Table 1.9 shows the number of doctoral graduates as listed in the ITE Directory by type of degree major. It should be noted that several of the degree options do not necessarily prepare faculty for industrial education, especially programs in occupational and adult education.

Table 1.8

ACTIVE DOCTORAL STUDENTS IN INDUSTRIAL EDUCATION

Number of Students	N of Univ.	%
1-5	18	43.9
6-10	8	19.6
11-15	6	14.7
16-20	2	4.9
Over 20	7	17.1
Total	41	100.0

Table 1.9

DOCTORAL GRADUATES REPORTED IN ITE DIRECTORY

Year	IA	IE	VE	TE	OE	Total
1984-85	24	44	57	5	56	186
1978-79	23	39	85	13	15	175
1969-70	44	40	29	10	0	123

IA=Industrial Arts IE=Industrial Ed VE=Vocational Ed
TE=Technical Ed OE=Occupational Ed

A factor that compounds the problem of projecting supply is that several of the doctoral graduates in industrial education were already faculty members at universities. Table 1.10 describes the rank by highest degree for all faculty listed in the 1984-85 ITE Directory. Only 52.3% have competed the doctorate. Data were not collected in the survey to determine how many of the doctoral graduates were current university faculty, however, the available supply of doctoral graduates to fill positions is reduced by the number of current faculty who complete programs.

Table 1.10

RANK BY HIGHEST DEGREE FOR FACULTY LISTED IN ITE DIRECTORY

Rank	Doc	Masters	B.S.	CAS	Other	Total
Professor	649	64				713
Assoc Prof	443	195	7	10	2	657
Asst Prof	243	443	23	10	3	722
Lect/Instr	14	324	97	4	19	458
Adjunct	1	8	4		2	15
Coordinator		4	1		1	6
Other	12	17	3		4	36
Total	1362	1065	135	24	31	2607
%	52.3	40.5	5.2	1.0	1.2	

Projections

The data indicate that there will be supply/demand problems when attempting to fill university faculty positions in industrial education with individuals who hold the doctorate. This was based upon retirement projections and current numbers of students pursuing the doctorate in industrial education or related areas. The findings and conclusions of this study do not account for demand based upon the factors of tenure denial, leaving higher education for private sector employment or death.

Slightly over 20% of the current faculty are between the ages of 55-69. An additional 19% are between the ages of 50-54. Thus 39% of the industrial education faculty are 50 years old or older. The field could easily experience a 40 percent turnover of faculty in less than ten years.

Looking at the worst case (Table 1.4), in the next five years there could be 467 positions open due to retirement, 268 new (additional) positions, and a loss of 92 positions for a total of 643 positions to be filled. Assuming that 50% of the doctoral graduates are prepared to teach industrial education and are not currently faculty members at universities or foreign students, approximately 90 people will be available for employment each year for a total of 450. Thus, there will be 1.43 vacancies for each applicant in the next five years. Of course these projections do not account for the technical expertise of the doctoral graduates and the demand by technical specialty in industrial education at universities. They also do not account for the unwillingness of potential faculty to move to different geographic locations for university employment.

Looking at the best case (faculty retire at age 65), in the next five years there could be 213 positions open due to retirement, 268 new (additional) positions and a loss of 92 for a total of 389 positions to be

filled. Assuming that 50% of the doctoral graduates are prepared to teach industrial education and are not currently faculty members at universities or foreign students, approximately 90 people will be available for employment each year for a total of 450. Thus, there will be a slight over-supply of applicants in the next five years. Again, these projections do not account for the technical expertise of the doctoral graduates and the demand by technical specialty in industrial education at universities. They also do not account for the unwillingness of potential faculty to move to different geographic locations for university employment.

In all probability, neither the "best" or "worst" case will occur, rather the actual demand will fall somewhere between the two. There should be approximately 1.2 vacancies per doctoral graduate in the next five years. This projection does not account for vacancies that result from faculty leaving for private sector employment, tenure denial, or death. **Thus, there should be more than one job for every doctoral graduate in the next five years.**

Implications

The findings of this study suggest a shortage of doctoral level individuals who are willing to accept university faculty positions in industrial education in the near future. This shortage has several implications for industrial education. The following are representative of the implications:

1. Universities may be forced to hire faculty who do not have the doctorate. This may further lower the "status" of industrial education at universities. In some extreme cases, programs at universities that require the doctorate for employment may close due to lack of doctoral level faculty.

2. A shortage of doctoral level faculty may have a negative impact on future research and development in the field of industrial education.

3. Salaries for high demand technical specialties may increase.

4. Without a surplus of applicants, universities may be forced to employ individuals who are not fully qualified, thus impacting on the quality of the program.

Recommendations

1. A graduate leadership development program, perhaps similar to EPDA, needs to be established with appropriate recruitment and funding for graduate studies.

2. An in-depth university level/industrial education data-base needs to be generated to add precision to supply/demand projections and assist department heads/chairs in employing faculty.

3. University level supply/demand data should be collected and analyzed for other occupational areas in vocational education.

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